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AUDIT COMMITTEE SIZE AND CARBON EMISSION DISCLOSURE OF LISTED OIL AND GAS FIRMS IN NIGERIA

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ABSTRACT

This study ascertained the effect of audit committee size on carbon emission disclosure of listed oil and gas firms in Nigeria for thirteen (13) year period spanning from 2012-2024. Panel data were used in this study, which were obtained from the annual reports and accounts of nine (9) listed oil and gas companies for the periods 2012-2024. Ex-Post Facto research design was employed. Inferential statistics using Panel least square regression analysis was employed to test the hypotheses of the study. Conclusively, the results of the tested hypothesis revealed that audit committee size has a significant and positive effect on carbon emission disclosure ($\beta_1 = 0.644524$; p-value = 0.0001 < 0.05). of listed oil and gas firms in Nigeria at 5% level of significance. The study recommended that firms in Nigeria should ensure strict compliance with the provisions of Companies and Allied Matters act (CAMA) of having between 5 to 6 members of equal representation three non-executive directors and three independent directors to ensure effective oversight and resource availability.

Key words: *Audit Committee Size, Carbon Emission Disclosure, Gender Diversity.*

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INTRODUCTION

Corporate governance is the set of processes, customs, policies, laws and regulations affecting the way a corporation or company is controlled. It is the system by which organisations are directed and control (Ejembi, Ijeoma, Amahalu & Obi, 2022). It focuses on the associations among management, board of directors, controlling shareholders, minority shareholders and other stakeholders (Ndu, Ifurueze & Amahalu, 2024). The board is imperative for the company's governance, and it is essential to have conclusive and result-oriented board activities in the companies. Corporate governance has drawn the attention of investors and government after the incidence of the 2007 financial crisis worldwide. The Cadbury Report issued by The Committee on the Financial Aspects of Corporate Governance in 1992, titled -

Financial Aspects of Corporate Governance, which has given recommendations for corporate boards, describes it as a mechanism by which companies are governed. The onus is on the board to ensure the implementation of strategies according to the framed policies, reduce the agency problem and enhance firm value in the best interests of shareholders. Climate change is one of the most complex environmental issues posing threats and providing opportunities for companies in all sectors. From a business point of view, corporate attitudes towards climate change have changed significantly in recent times. In the early 1990s, businesses are often found to cover up or ignore climate change issues. Over time, the goal of business has changed from an emphasis on shareholder satisfaction alone towards mutual benefits for business and societies (Agweda, Okoye, Amahalu, Egolum & Obi, 2024). Companies, as part of society, are now faced with the challenge of how to reduce emissions to mitigate climate change. In addition, they are concerned with how climate change will impact upon their operations, since the increase in atmospheric temperature has given rise to an accumulation of greenhouse gas (GHG) emissions, especially of carbon dioxide (Amahalu & Okudo, 2023).

The political context in which different countries have different positions concerning the future of international climate policies exposes companies to a very high level of regulatory uncertainty (Amahalu & Moedu, 2023). In the absence of a global regulatory framework for climate change, many firms now consider a climate strategy, a vital business practice for competitive reasons. Furthermore, even in the absence of government regulation, numerous firms have decided to constrain their impact on the global climate and publicly adhere to a specific carbon norm, such as carbon neutrality or carbon labels, to show their commitment to climate change mitigation on a voluntary basis or in response to stakeholder pressure from investors, suppliers, or consumers (Okudo & Amahalu, 2023). As a consequence, an increasing number of firms around the world carefully consider create and implement carbon management strategy to mitigate carbon emissions.

Businesses around the world require development and growth in order to attract funding from investors. Before they invest in a particular business, investors normally make sure that the business in question is financially secure and stable and possesses the ability to produce profits in the long run (Aruna, Orji-Okafor & Amahalu, 2024). Hence, in instances where the company position is not as promising, it will not be as attractive to investors as it hopes to be. This failure to attract enough capital normally leads to negative consequences for the business in particular and for the economy in general (Uduehe, Okoye & Amahalu (2024).

It is against this backdrop that the study sought to evaluate the effect of audit committee size on carbon emission disclosure of listed oil and gas firms in Nigeria.

LITERATURE REVIEW

Audit Committee Size

In order to perform their role effectively, audit committees should have adequate resources and authority to discharge their increasing responsibilities. Sylvanus, Okoye, Amahalu and Mbonu (2024) argues that the larger the audit committee, the more likely it is to uncover and resolve potential problems in the financial reporting process, because it is likely to provide the necessary strength and diversity of views and expertise to ensure effective monitoring. This suggests that audit committee size is an integral factor for firms in delivering meaningful corporate reporting. However, it can also be argued that as the number of audit committee members increases, each may be comforted by the presence of others and free riders emerge (Sylvanus, Okoye, Amahalu, Obi & Ozoji, 2024). In addition, larger audit committees are also likely to suffer from process losses and diffusion of responsibility (Ezennia, & Amahalu, 2024). The Smith Report (2003) recommends a minimum of three non-executive directors. According to SEC Code of Corporate Governance 2011, the audit committee should consist of not less than three directors of which independent directors should have the majority, and the committee is chaired by independent nonexecutive director. The role of audit committee in ensuring sound corporate governance and enhancing firm financial performance is widely accepted (Mba, Mbonu & Amahalu, 2023). Ineffective corporate governance mechanisms can lead to financial distress, which can be mitigated by an effective audit committee (Eneh, Okeke & Amahalu, 2023). On the other hand, effective audit committee characteristics are crucial for helping the company make long-term sustainable progress (Amahalu, Okudo & Ezechukwu, 2023). Several studies have confirmed the value of the audit committee in improving firm performance, reducing accounting flaws in internal controls and improving financial reporting quality (Amahalu, Okudo, Okafor & Onyeka, 2023). Audit committees serve a crucial role in guaranteeing the integrity of financial reporting, and thus, the committee's characteristics and membership have a substantial impact on the financial performance of corporate organizations (Adibeli & Amahalu, 2023).

Carbon Emissions Disclosure

Emission is the production and discharge of something, especially gas or radiation (Aderobaki, Amahalu & Adeniyi, 2024). According to Amahalu, Aruna & Orji-Okafor (2024), emission is anything that is been released out into the open. But more often it refers

to gases being released into the air, like greenhouse gasses or emissions from power plants and factories. Emissions are basically chemicals in exhaust gases that are harmful to air quality, mainly carbon monixide (CO), hydrocarbons (HC), and nitrogen oxides (NO). Carbon emission is the release of carbon into the atmosphere (Amahalu, Aruna & Orji-Okafor, 2024). Emission is an amount of something, especially a gas that harms the environment, that is sent out into the air (Amahalu, & Okudo, 2023). A carbon price is a cost applied to carbon pollution to encourage polluters to reduce the amount of greenhouse gas they emit into the atmosphere (Okoye, Amahalu Okoye & Obi, 2022). A carbon price is the method widely agreed to be the most efficient way for nations to reduce global warming emissions. To Mbonu and Amahalu (2022), it is a cost applied to carbon pollution to encourage polluters to reduce the amount of greenhouse gases they emit into the atmosphere: it usually takes the form either of a carbon tax or a requirement to purchase permits to emit, generally known as carbon emissions trading. Against the need for more concise scholarship regarding the discourse, the following hypothesis envisaged:

Ho_1: Audit committee size has no significant effect on carbon emission disclosure of listed oil and gas firms in Nigeria

Size of Audit Committee and Carbon Emissson Disclosure

Most of the regulations including that of Nigeria require the provision of equal number of shareholders and directors to run the audit committee. As highlighted earlier, section 359(6) of the Companies and Allied Matters Act (CAMA) requires every public company to have an audit committee which shall have a maximum of six members of equal representation by three shareholders and three directors.However, previous studies provide mixed findings on the impact of audit committee size on emission disclosure. Modozie and Amahalu (2022) found no association between size of audit committee and emission disclosure. On the other hand, Leng (2023) found that there is a significant negative relationship earnings management which suggested that larger audit committee may mitigate the emission disclosure in a firm. Furthermore, Ubeh, Okoye, Nwoye & Amahalu (2024). documented that audit committee size was positively associated with environmental activities. They argued that a larger audit committee has more resources and capabilities, and thus is better in performing the required duties. Udo, Oraka and Amahalu (2022) found no significant relationship between audit committee size and earnings management.

Theoretical Framework

Agency Theory

Agency theory is an economic theory that views the firm as a set of contracts among self-interested individuals. An agency relationship is created when a person (the principal) authorizes another person (the agent) to act on his or her behalf. Agency theory was developed by Jensen and Meckling (1976). They suggested a theory of how the governance of a company is based on the conflicts of interest between the company's owners (shareholders), its managers and major providers of debt finance; the shareholders want to increase their income and wealth. Agency theory studies the problems and solutions linked to delegation of tasks from principals to agents in the context of conflicting interests between the parties. Beginning from clear assumptions about rationality, contracting, and informational conditions, the theory addresses problems of ex ante ('hidden characteristics') as well as ex post information asymmetry ('hidden action'), and examines conditions under which various kinds of incentive instruments and monitoring arrangements can be deployed to minimize the welfare loss.

Stakeholder Theory

Stakeholder theory was first described by Dr. F. Edward Freeman in 1984. Freeman's theory suggests that a company's real success lies in satisfying all its stakeholders, not just those who might profit from its stock. stakeholder theory is based on the assumption that businesses can only be considered successful when they deliver value to the majority of their stakeholders. That means that profit alone cannot be considered the only measure of business success. Stakeholder theory posits that the essence of business primarily lies in building relationships and creating value for all its stakeholders. An organization needs to be mindful not only of those who hold stock in the company, but also of those who work in its stores, those who work and live near its factories, those who do business with it, and even of competitors, as the company may shape the landscape in its industry. The relevance of stakeholder theory to organizations include: higher productivity through employee satisfaction; improved retention / referrals from happy customers; increased investment from happy financiers; improved talent acquisition from a positive image in the community; increased mental health of the workforce through job satisfaction; scientific progression which benefits all; elevation of the socio-economic status of the local community; contribution towards a healthy competitive ecosystem where other companies can also thrive and bring benefits to their own stakeholders in turn.

Empirical Review

Munyradadzi and Nirupa (2016) explored the effect of board composition and board size on financial performance of companies listed on the Johannesburg stock exchange in South Africa 2010-2014. The statistical instrument used was the fixed effect Panel least Square regression. Result showed that board size is not significantly associated with Tobin's Q and ROE (performance measures). In contrast to this result, board size was found to be positively associated with ROA.

Usman Shettima and Nazam Dzolkarnaini (2018) examined the relationship between board characteristics and microfinance banks performance in Nigeria. This was tested using a sample of 120 firm-year observations covering 30 micro finance institutions (MFIs) in the periods of 2010 to 2013. The statistical instrument used was the fixed effect Panel least Square regression. The study found a negative and non-significant relation between female directors and return on assets of MFIs.

Onwuchekwa (2019) investigated the association between board characteristics and earnings management practices of quoted firms in Nigeria. A longitudinal survey was used covering a time frame of six years (2007-2012). The statistical instrument used was the Panel least Square regression technique. The study found that board independence and audit committee independence have a negative relationship with discretionary accruals.

Ogbulafor, Alpheaus and Azubuike (2025) investigated the effect of board characteristics on the financial performance of listed Deposit Money Banks (DMBs) in Nigeria, focusing on CEO duality and audit committee size. Secondary data were collected from the annual reports of ten listed DMBs spanning the period 2013 to 2022. Descriptive statistics, correlation analysis and panel data techniques based on robust least squares regression, were used to analyze the data. The methodology accounted for non-normality and heteroscedasticity in the dataset, using Huber regression and M-estimation procedures to reduce the influence of outliers. The findings indicated that CEO duality and audit committee size showed no significant effect on ROA, with p-values of 0.8345, and 0.2930 respectively. The results suggested that increasing audit committee size does not automatically lead to better financial outcomes. The insignificance of CEO duality challenges assumptions regarding leadership structure's influence on performance. The study concluded that effective governance in the Nigerian banking sector requires a holistic approach that prioritizes the quality of board composition and independence over mere structural attributes and recommends that regulatory bodies prioritize board independence in governance reforms, as it has a measurable

impact on financial performance. Additionally, emphasis should be placed on improving the quality and expertise of audit committee members rather than simply increasing their number.

MATERIAL AND METHODS

Ex-post facto research design employed in this study. The population and sample size of this study consist of all the nine (9) Oil and Gas firms listed on the Nigerian Exchange (NGX) Group as at 31st December, 2024. They are: Ardova Plc, Conoil Plc, Eterna Plc, Japaul Gold and Venture Plc, MRS Oil Nigeria Plc, Oando Plc, Seplat Energy Plc, Total Nigeria Plc, and Capital Oil Plc.

Table 1 Variable Description

Variable	Proxies	Acronym	Measurement
Independent Variable			
	Audit Committee Size	ACS	Measured as the total number of audit committee members
Dependent Variable			
	Carbon Emission Disclosure	CED	$\frac{\text{Total Carbon Emission Score Disclosed}}{\text{Maximum Number of Carbon Emission Score that a firm could Disclose}}$

The volume of carbon emission disclosure emission was measured by content analysis to find the degree of volume of carbon emission that were disclosed in Sustainability Reports. Disclosure of carbon emission is measured by scoring a maximum score of 18 (see appendix A) and the minimum score is 0. Each item is worth 1 if the company discloses all of the information in the report so that mean company score is 18. Score on each company then totaled and divided by 18. The carbon emission disclosure checklist, adapted from Global Reporting Initiative standards can be seen in appendix A. A non-weighted (binary) index will be devised to examine the narrative sections of the annual and stand-alone sustainability reports (for example, chairman or director's statement, review of sustainability activities and discussions) for each entity. If the entity disclosed a certain item at least once, the score will be assigned as 1, and 0 otherwise. Hence, carbon disclosure index (CDI), including 18 items, will be identified to measure the extent of carbon disclosures provided by the entities. The

carbon disclosure score was calculated by dividing the items disclosed to a maximum number of items that a firm could disclose. The total CDI score was calculated as:

$$CDI = \frac{\text{Items disclosed}}{\text{Maximum number of items that a firm could disclose (that is, 18 items)}}$$

This study adapted and modified the model of Okocha, Okoye, Amahalu, & Obi, (2022):

$ERD = \beta o + \beta_2 BDSZ_{it} + \mu_{it}$ ……Eqn 1.

Where :

ERD = Environmental Remediation Disclosure

GDV = Gender Diversity

BDSZ = Board Size

ACFE = Audit Committee Financial Expertise

Consequent upon the adapted model, the following regression equations were constructed:

$CED_{it} = \beta o + \beta_1 ACS_{it} + \mu_{it}$ ……Eqn 2.

Where:

β_o = Constant term (intercept)

β_{it}= Coefficients of Board Characteristics for firm í in period t

μ_{it} = Error term/unexplained variable(s) of firm í in period t

CED_{it} = Carbon Emission Disclosure of firm í in period t

ACS_{it} = Audit Committee Size of firm í in period t

RESULT AND DISCUSSIONS

Test of Hypothesis

H_o: Audit committee size has no significant effect on carbon emission disclosure of listed oil and gas firms in Nigeria

H_1: Audit committee size has significant effect on carbon emission disclosure of listed oil and gas firms in Nigeria

Table 2: Panel Least Square Regression Analysis testing the effect of ACS on CED

Dependent Variable: CED

Method: Panel Least Squares

Date: 05/04/25 Time: 19:38

Sample: 2012 2024

Periods included: 13

Cross-sections included: 9

Total panel (balanced) observations: 117

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.599484	0.077207	7.764651	0.0000
ACS	0.644524	0.159697	4.035908	0.0001

R-squared	0.124067	Mean dependent var	0.905385
Adjusted R-squared	0.116450	S.D. dependent var	0.169138
S.E. of regression	0.158986	Akaike info criterion	-0.823059
Sum squared resid	2.906791	Schwarz criterion	-0.775842
Log likelihood	50.14896	Hannan-Quinn criter.	-0.803890
F-statistic	16.28855	Durbin-Watson stat	1.443017
Prob(F-statistic)	0.000098		

Source: E-Views 10.0 Regression Output, 2025

The following regression equation was obtained from table 4.6:

CED = 0.599484 + 0.644524 ACS

Using the above model, it is possible to determine the relationship between CED and ACS. Holding all other factors constant, an increase in one unit of ACS results into a corresponding increase of 64.45% in CED, this means that a positive relationship exists between the CED and ACS. The slope coefficient shows that the probability value: $P(x_1=0.0001<0.05)$ is less

than the critical P-value of 0.05. This implies that ACS has a significant relationship with CED at 5% significant level. Results in table 4.6 also indicated that the R-squared for the model is 0.124067, meaning that the independent variable (ACS) explained 12.41% of the variation in CED. Only 87.59% of variation in CED is not explained by the regression model. The Durbin-Watson value of 1.443017 indicates the absence of serial correlation in the model.

Decision:

The P-Value of the test Prob(F-statistic) = 0.000098 is less than the α-value of 0.05; therefore H_1 is accepted and Ho is rejected. Since the p-value of the test is less than 0.05, then there exists enough evidence to reject the null hypothesis and conclude that audit committee size has a significant and positive effect on carbon emission disclosure of listed Oil and Gas firms in Nigeria.

CONCLUSION AND RECOMMENDATIONS

Firms in Nigeria should ensure strict compliance with the provisions of Companies and Allied Matters act (CAMA) of having between 5 to 6 members of equal representation three non-executive directors and three independent directors to ensure effective oversight and resource availability.

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Table 1: Carbon Management Disclosure Checklist

Climate Change: risks and opportunities	CC1- Assessment/description of the risks (regulatory, physical or general) relating to climate change and actions taken or to be taken to manage the risks
	CC2- Assessment/description of current (and future) financial implications, business implications and opportunities of climate change
GHG Emission	GHG1- Description of the methodology used to calculate GHG emissions (e.g. GHG protocol or ISO)
GHG Emission	GHG2- Existence external verification of quantity of GHG emission- if so by whom and on what basis
	GHG3- Total GHG Emissions – metric tons CO2-e emitted
	GHG4- Disclosure of scopes 1 and 2, or scope direct GHG emissions
	GHG5- Disclosure of GHG emissions by sources (e.g. coal, electricity, etc.)
	GHG6- Disclosure of GHG emissions by facility or segment level
	GHG7- Comparison of GHG emissions with previous years
Energy Consumption	EC1- Total energy consumed (e.g. tera-joules or peta-joules)
	EC2- Quantification of energy used from renewable sources
	EC3- Disclosure by type, facility or segment
GHG Reduction and Cost	RC1- Detail of plans or strategies to reduce GHG emissions
	RC2- Specification of GHG emissions reduction target level and target year
	RC3- Emissions reductions and associated costs or savings
	RC4- Cost of future emissions factored into capital expenditure planning
Carbon Emission Accountability	AEC1- Indication of which board committee (or other executive body) has overall responsibility for actions related to climate change
	AEC2- Description of the mechanism by which the board (or other executive body) reviews the company's progress regarding climate change

Source: Global Reporting Initiative Standards, 2025